STATEMENT FOR PRESENTATION TO THE PUBLIC HEARING OF THE CALIFORNIA WATER RESOURCES CONTROL BOARD October 19, 1977 AT SACRAMENTO REGARDING THE PROPOSED REVISION OF THE CALIFORNIA OCEAN PLAN (Dated AUGUST 1977)

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I am pleased to have this opportunity to comment on the proposed revisions to the California Ocean Plan. In past years I have participated in the design of most of the major outfalls along the California coast as a special hydraulics consultant and am presently so engaged for the City and County of San Francisco (as a special consultant to the firm of CH_2M Hill).

At Caltech I have been involved in research on dispersion and mixing of wastewater discharges, and am presently Director of the Environmental Quality Laboratory, an interdisciplinary policy study center for environmental problems.

However, my comments here are given as an individual and not as representing either Caltech or any of the sewerage agencies.

1. The proposed revisions present significant improvements over the original Ocean Plan of 1972, especially for toxic materials. The staff and the Board are commended for seeking rational and innovative approaches which, if adopted, will probably be copied in time by other states, the federal government and foreign countries.

2. I strongly support the change in strategy for toxic materials limitations as set forth in Chapter IV, Table B. The new procedure logically starts from a definition of the objectives for the receiving water quality and back calculates emissions concentration limitations for each outfall based on the outfall's performance or dilution. This is a significant step forward from the previous Table B effluent limitations (1972 Plan) for two reasons:

a. It avoids arbitrary and unnecessarily strict requirements which if fully enforced would result in expenditure of public monies greatly in excess of what might be needed to solve any identifiable problem, and

b. It provides the sewerage agencies with the opportunity and the incentive to consider the collection, treatment, and outfall facilities as a single system and to determine the most feasible tradeoffs among source control, removal by treatment, and dispersal by outfalls for handling trace contaminants.

Since the same reasoning applies to Table A, I recommend that the Board sometime change Table A also to ambient water quality values with a dilution calculation for effluent values.

3. The new ambient water quality limitations presented in Table B should be carefully reviewed every few years; the success of this new approach depends on the willingness of the Board to respond to new research results by tightening or relaxing individual standards, and adding new ones as appropriate.

4. The state of the art of predicting outfall performance is well enough advanced that it is feasible to make a Table B calculation separately for each discharger as conceived in the revised plan. It is important, however, for the State Board to define its method of analysis carefully (presumably to be a separate document , since the proposed ocean plan revision does not include it). Since there are presently some differences in approach and because the state of the art may be expected

to advance further in the years ahead, it is essential that the agencies have the option to make and submit their own evaluations of dilutions for consideration by the State and Regional Boards, as specified in footnote 12, paragraph 2. For all new outfalls, the design engineers will have made extensive analyses of the dilution as part of the design job. (For more discussion of dilution calculations see item 13 below.)

5. It is indicated on page A10, section VI.D.2, that a discharging agency may request an exception to Table B provided that (among other preconditions) the "discharge takes place through a submerged offshore outfall and diffuser which results in a minimum initial dilution of 50:1". I believe this condition is unnecessarily restrictive and discriminatory without a scientific basis; i.e., it allows exceptions to be considered for some outfalls such as for dry weather sewage flows (where the dilution would normally be greater than 50:1 anyway), while precluding consideration of exceptions for other outfalls such as for power plant cooling water, LNG plant circulating water, wet weather discharges (such as for the City and County of San Francisco), etc. It is this latter class which is more likely to be candidates for various exceptions or special provisions. I recommend that every request for an exception to Table B be approved or denied on its merits without a minimum dilution as a <u>general</u> condition.

As an alternative, appropriate minimum dilutions (as a condition for considering exceptions from Table B) could be specified for different outfall classes, to represent the objective that good outfalls will be used as appropriate for each class and preclude requests for Table B exceptions because of inadequate outfalls.

6. Wet weather flows (such as from the outfall system now being designed for the combined sewers of the City and County of San Francisco) should perhaps be given special mention in the requirements. They have the characteristic that they are only intermittent (typically only a few percent of the time). The hazards of chronic toxicity from

flows from wet weather outfalls are likely to be minimal compared to dry weather sewage flows. A reasonable way to deal with wet-weather combined sewage flows is to specify that the requirements be based on the full time series of values including days when the wet weather outfalls are not in use. In other words, during days of use calculate mean effluent values on a flow-weighted basis, and when no flow is discharged consider the concentration to be 0 for the day. For Table A contaminants obtain monthly or weekly averages by an arithmetic mean over the whole number of days in the time sequence including zeros and without flow weighting. For Table B, the median values would most likely be zero, and the controlling requirements would be the statements of the first two paragraphs of page A-17 (continuation of footnote 12), namely: calling for special review of daily or grab samples which exceed c_e (the allowed median 6-mos. effluent concentration) by factors of 4 or 10, respectively; and specifying the daily mass emission limit, presumably averaged over some period like a month.

7. In table B on page A-7 it should be clarified whether the six-months median is based on moving six-month periods or fixed half-years. Also in Table A it should be indicated whether the monthly and weekly averages are moving averages or calendar periods.

8. On page A8, the "Staff Proposal for Amendment to Table B of the Ocean Plan," dated May 1976, indicates a conservative estimate for acute toxicity of chlorine residual at 0.02 mg/l and for chronic toxicity, 0.01 mg/l. Because of chlorine's high reactivity with organics, the acute toxicity problem is of more concern than the chronic because chlorine residual declines (like BOD) rather than being conserved like a trace metal.

The specification of 0.002 mg/l as the allowable chlorine residual after dilution may be too strict in some cases, as this value is 10 times smaller than the conservative estimate of acute toxicity*, for comparison, note that the old Table B number (1.0 mg/l) with implied 100:1 dilution gives an ambient value of 0.01, which is 5 times larger than the new value.

*Also limit of detection in standard test methods is given as 0.02 mg/l (page A-17).

If this tightening of the chlorine residual requirement necessitates large additional construction or operating costs, then case-by-case exceptions should be studied and evaluated. Furthermore, a partial relaxation of bacterial requirements may be considered as another response to increased concern over potentially damaging chlorine discharges to the ocean. For example, is it really necessary to chlorinate wet weather discharges into the chilly Pacific Ocean in winter to meet the bacterial requirements for bathing waters?

9. A toxicity concentration of 0.05 tu as defined by footnote 13 is included one of the ambient water quality objectives in Table B. But since this value is less than one, the normal test procedure does not apply. As an alternative to giving an ambient water quality objective, I suggest a simple statement that the 6-months' median effluent value of T_c be such that

$$T_c \leq (D_m + 1)/20 \text{ for } (D_m + 1) > 20$$

or

$$\leq 1 \text{ for } (D_m + 1) < 20$$

(This approach avoids the need of defining toxicity of dilute mixtures.)

10. In Section II.C.1, paragraph 2, I suggest rewording as follows to exclude the effects of induced upwelling (italics indicate words added):

> "The dissolved oxygen concentration[8] shall not at any time be depressed more than 10% from that which occurs naturally, as the result of the discharge of oxygen demanding waste material, *excluding the effects of induced upwelling by the buoyancy of the discharge.*"

11. Footnote 5, referred to by Sections II B3, C3, and C4, states

> "A significant difference is defined as a statistically significant difference in the means of two distributions of sampling results at the 95 percent confidence level."

Defining a significant difference purely in terms of significance of a statistical test is inappropriate, I believe, because there is not necessarily any relation to ecological significance. For example, a statistically significant change of light transmissibility in a waste

field below the photic zone might be completely unimportant ecologically even though careful and repeated physical measurement might show a significant decrease as a result of the discharge.

12. The wording of Section III.C on page A-4 needs to be improved. It now reads:

> "Waste effluent shall be discharged in a manner which provides sufficient initial dilution to minimize the concentrations of substances not removed in treatment.[10]"

Since the expenditure of additional funds for longer and deeper outfalls has no definite limits there is no way in which one can find a minimization of the concentration of substances as indicated. Perhaps alternatively what is desired is a statement that outfalls should be equipped with multiport diffusers, where appropriate, in order to provide large initial dilutions.

Also the wording of footnote 10, to which the above statement refers, and footnote 9, should be clarified. Apparently they mean that the minimum initial dilution should be 50:1 in case Table B cannot be met without an exception; otherwise there is no dilution requirement (cf. item 5 above).

13. The minimum initial dilution D_m is involved in the calculation specified by equation (1) in footnote 12 for finding effluent limits for Table B substances. D_m is defined by the last paragraph of footnote 6 on p. A-13, which reads:

> "For the purpose of this Plan, minimum initial dilution is the lowest average initial dilution within any single month of the year. Dilution estimates shall be based on observed waste flow characteristics, observed receiving water density structure, and the assumption that no currents flow across the discharge structure."

The exact meaning needs clarification. On the basis of my discussions with WRCB staff, I propose the following alternate statement which hopefully preserves the original intent, while making it operationally clearer:

For the purpose of this Plan, a minimum initial dilution D_m is calculated for use in conjunction with Table B to find effluent limits for each outfall. It is intended to be a single representative value for this purpose alone, and it is recognized that the actual dilution achieved in the ocean at a given outfall is a variable which is complex function of current speed and direction, effluent flow and density, ambient density structure, and sampling interval in time and space or averaging procedures. In concept D_m is defined to be the result of the following calculations:

a.) Determine representative ambient density profile(s) for each calendar month;

b.) Determine the flow-duration curve for the outfall (frequency distribution of discharge rate);

c.) Assume the ambient current is small so that there is no dynamic effect on the initial dilution, but that there is enough current to provide slow flushing of the area (e.g., ~<0.1 knot);

d.) Calculate the expected frequency distribution of initial dilutions for each month by a suitable plume model to be specified by WRCB. These dilution values are to be plume "averages" derived from averaging plume concentration profiles weighted with the volume flux;

e.) Representative values of dilution are derived for each month by an appropriate averaging technique (flow-weighted);

f.) Select the minimum value of this group of 12 monthly values for any year. This is the D_m or "minimum initial dilution" referred to above.

14. On page A-17 an emission limit is specified according to a formula

$$\text{lbs/day} = 8.34\ c_e\ Q\ .$$

For application to power-plant cooling water or other systems involving an intake of ocean water there should be a deduction for the amount of mass flux in the intake. If the intake flow rate is equal to the discharge rate then the formula should become

$$\text{lbs/day} = 8.34\ (c_e - c_s)\ Q.$$

This change would be very helpful, both for the discharger and the regulator, as it would remove the necessity from monitoring the through-flux of metals already in seawater, and focus attention on the increments added by the inplant processes. In other words, a problem would arise if the background level of some trace metal in seawater varied somewhat from the nominal value provided by the Table on the bottom of page A-16.

* * *

In concluding I want to support the Board in its recommendation to EPA and Congress that the Public Law 92-500 be amended in such a way as to provide a procedure for granting exceptions to the mandated secondary treatment requirement of Section 301. The uniform installation of secondary treatment for all discharges to the coastal waters in California is unnecessary and wasteful of our resources.

If the provisions of the federal law are changed, then I recommend that Table A of the California Ocean Plan be relaxed or exceptions considered on a case-by-case basis, so that advanced primary treatment with high outfall dilution would be acceptable in many cases. More attention can then be given to controlling the entry of toxic materials into the environment (by all routes, including sewers), instead of building costly secondary treatment plants primarily for the purpose of oxidizing naturally occurring ecosystem materials such as carbon and nitrogen.